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FOLDABLE DISPLAY DEVICE**CROSS-REFERENCE TO RELATED APPLICATION**

This application claims priority to and the benefit of Korean Patent Application No. 10-2015-0045982, filed on Apr. 1, 2015 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND**1. Field**

The present invention relates to a foldable display device.

2. Description of the Related Art

A foldable display device uses a flexible display panel that may be bent. The foldable display device is easy to carry when folded and provides a large screen when unfolded. Therefore, the foldable display device may be applied in a variety of fields including mobile devices such as mobile phones, ultra-mobile PCs, electronic books and electronic newspapers but also televisions and monitors.

The foldable display device includes a case that supports the flexible display panel. The case is configured to support a lower surface of the flexible display panel, which has a bendable area between flat areas on both sides. For example, the case may include flat parts that correspond to the flat areas on both sides and a hinge (e.g., a hinge part), which are formed in the middle to correspond to the bendable area. The flexible display panel may be folded as the case is bent. Here, the inside of the bendable area is contracted by a compressive force, and the outside of the bendable area is stretched by a tensile force. However, because the flexible display panel is constrained by the support structure, stress generated by the compressive and tensile forces fails to be released. This stress may damage the flexible display panel, thereby reducing durability.

In addition, the hinge and the bendable area may interfere with each other at the initial stage of bending of the flexible display panel, and the interference may aggravate the stress of the bendable area.

SUMMARY

Aspects of the present invention are directed to a foldable display device that can suppress (e.g., reduce) the damage to a flexible display panel and increase durability by reducing bending stress of the flexible display panel.

However, aspects of the present invention are not restricted to those set forth herein. The above and other aspects of the present invention will become more apparent to one of ordinary skill in the art to which the present invention pertains by referencing the detailed description of the present invention given below.

According to an embodiment of the present invention, there is provided a foldable display device including: a flexible display panel including a bendable area and flat areas on both sides of the bendable area; and a lower case housing the flexible display panel and including: a hinge corresponding to the bendable area and including a first rotation point connected to a first link having a first radius of rotation and a second rotation point connected to a second link having a second radius of rotation, the second radius of rotation being different from the first radius of rotation; and supports on both sides of the hinge and corresponding to the flat areas, wherein the first link has an end connected to the

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first rotation point and a first guide opening connected to each of the supports, and the second link has a first end connected to the second rotation point and a second end engaging the first guide opening.

In an embodiment, each of the supports includes a support plate configured to support the flexible display panel, a bottom portion opposite the support plate, and sidewalls extending from both sides of the bottom portion and perpendicular to the support plate, and each of the sidewalls includes a second guide opening extending in a different direction from the first guide opening, and the second end of the second link engages the second guide opening.

In an embodiment, each of the sidewalls includes a first moving protrusion configured to move along the first guide opening, and the second end of the second link includes a second moving protrusion configured to move along the first guide opening and the second guide opening.

In an embodiment, at least part of the first guide opening includes a region extending in a first direction, and the second guide opening extends in a second direction orthogonal to the first direction.

In an embodiment, the first guide opening further includes a region sloping from an end of the region extending in the first direction toward a lower part of the hinge.

In an embodiment, each of the supports includes a support plate configured to support the flexible display panel, a bottom portion opposite the support plate, and sidewalls extending from both sides of the bottom portion and perpendicular to the support plate, and each of the sidewalls includes a second guide opening extending in a different direction from the first guide opening, the first link includes a third guide opening extending in a direction perpendicular to the second guide opening, and the second end of the second link engages the second guide opening.

In an embodiment, wherein the first guide opening is closer to the hinge than the third guide opening.

In an embodiment, each of the supports includes a support plate configured to support the flexible display panel, a bottom surface opposite the support plate, and sidewalls extending from both sides of a bottom portion and perpendicular to the support plate, wherein the first link extends in the same direction as the sidewalls, and a height of the first link is substantially equal to those of the sidewalls.

In an embodiment, the second link has a bent shape, and a height of the second rotation point along the second direction from a bottom of the hinge is greater than that of the first rotation point.

In an embodiment, the hinge includes a spindle configured to provide a rotational force to at least one of the first rotation point and the second rotation point, and an upper case coupled to the lower case to maintain a shape of the flexible display panel.

In an embodiment, a radius of rotation of the first rotation point is greater than that of the second rotation point.

According to an embodiment of the present invention, there is provided a foldable display device including: a flexible display panel including a bendable area and flat areas on both sides of the bendable area; supports under the flexible display panel and corresponding to the flat areas, the supports being configured to support the flexible display panel; and a hinge between the supports and configured to rotate each of the supports using a first link connected to a first rotation point and a second link connected to a second rotation point, the second rotation point being different from the first rotation point, wherein each of the supports includes a support plate contacting the flexible display panel and sidewalls perpendicular to the support plate, wherein the